Bee(coming) With:
An Exploration into the Multi-generational Effects of the Bee Assemblage

In January of 2017, bees were declared an endangered and protected species, and since then their population has continued to decrease. In the span of only two decades, the population has dropped by about 87 percent, the bulk of which happened between 2006 and 2007 (Silva). In the United States, the rusty patched bumble bee now only remains in 13 of the 28 states it originally inhabited (U.S. Fish and Wildlife Service). When thinking about multispecies assemblies and inter- and intraspecies relatings, this stark drop in population is incredibly important. In the United States bees pollinate over 90 commercial crops that we rely on for food production, and one third of global food production depends on bees (Silva). Bees have been around for 137 years, and without them, a whole slew of vibrant life forms that transformed alongside them wouldn't exist. In order to make sense of how and why they are in a state of "crisis," we need to recognize that bees are multispecies players, enmeshed in myriad configurations of lifeways, non-living things, times, places, and meanings. By understanding the bee as an assemblage, we can begin to acknowledge the multigenerational outcomes of our productive, powerful, and dangerous encounters with them. Using a theoretical framework of an assemblage as a starting point, this paper will then explore the historical militarization of the bee, the transformative effects bees and humans have on each other, and finally the unintended consequences of those entanglements.

Part 1: Theorizing the Assemblage

To understand our complex relationship with bees, it is helpful to look at the bee as an assemblage. As Tsing defines it, an assemblage is an "open ended entanglement of the ways of being," that is made possible through a collective movement (Tsing 83). When taken literally, the bee could be understood as an assembly by the sheer nature of a hive: within a single colony, thousands of members are organized and protected through a complex division of labor, and the "intricate fluidity" of its social exchanges, practices, and connections (Insectopedia, 188). However, Tsing forces us to take this understanding one step further. Rather than the gathering of a *single* species, assemblages are the coming together of lifeways and nonliving things to make living arrangements for themselves and for others (Tsing 23). In this sense, the bee as an assemblage pushes beyond the two way relationship of simply bee and human. Instead, it is the constant harmonization and intertwining with abiotic forces, such as pesticides or weather, and biotic forces, such as plants, humans, or other insects. As Tsing sees them, assemblages are not just groupings of organisms, but a gathering of beings that exist because of their connections in that context (Tsing 23). Furthermore, if we keep in mind Tsing's concept of polyphonic assemblages, bees emerge as vibrant life forms through the gatherings of complex rhythms and world-making projects (Tsing 24). These complex rhythms, whether they be a farm's pesticide spraying routine, pollen transport, or a hive inspection, overlap to form the modern honeybee as we know it.

Essentially, the modern bee as a new, emergent life form, is possible through multispecies collaborations and contamination. In Donna Haraway's language, bees are "tentacular," meaning they exist in open and knotted systems, in which attachments, detachment, and connections are

formed. Like the eight legged animal the term derived its name from, bees entangle and entwine those around it with its tentacles, making networks, nets and new forms of life (Haraway 31). Through our reliance on bees and their reliance on us, all beings in the assemblage are existing within a network of collaborations within and across species, leading to myriad of transformations for all involved. We are constantly in a state of "sympoisesis," as bees, humans, and plants are always "making-with," as part of a complex, larger system (Haraway 58). Ultimately, this ceaseless collaboration and movement with bees is the very way in which world making processes are made, and even how "gatherings" can become "happenings" (Tsing 28). For instance, in Jake Kosek's article entitled, *Ecologies of Empire: On the New Uses of the Honeybee,* we can see this idea of mutual transformation comes into play by that ways in which human desires and worries have physically remade the bee. From deliberate intervention in federal laboratories or apiaries, to the unintentional effects of climate change and industrial agriculture on bees, we have transformed their anatomy and behavior (Kosek 651). Additionally, by using bees as military weapons or for their strategic behaviors, bees have been fundamental in the shaping of our empire. While Kosek argues that bees have become "more human" throughout this process, one could also push that argument one step further by claiming that humans have become "more bee" (Kosek 651). Through these perpetual collaborations and contaomintations within and across species, we are creating an infinite slew of transformations for all beings involved.

Furthermore, this relentless "becoming-with" is even more apparent when the domestication of the bee is stressed. While the bee is often cast as a human or farm's passive "companion," Haraway would urge us to step away from human exceptionist point of view.

Species of all types and sizes are responsible in shaping, altering, and infecting those around them (Haraway 15). Whether or not it is given the label of "companion," the bee is just as much a forcer as its complement is in shaping the entanglements of our human-animal world. From what we eat, how we farm our food, and even how we make sense of our socialities and hierarchies, bees have been active sculptures on the human condition.

Essentially, our complex history with bees suggests that our current relationship with them was already pollutions by thousands of years of encounter. Kosek's demand that we draw attention to the "entangled histories" of humans and bees is echoing Tsing's argument that collaboration is only possible due to our diverse histories of previous interactions (Kosek 651) . In her words, "the evolution of selves is already polluted by histories of encounter; we are mixed up with others before we even begin any new collaboration" (Tsing 29). In order to prevent a further drop in bee populations worldwide, we need to think about the ways in which humans and the other actors within the assembly have been "mixed up with others" for centuries. Rather than pretending that we aren't part of this entanglement, we need to situate the discussion of endangerment in a greater historical framework. Ultimately, the changes that bees experience are only possible due to a building out of a never ending flow and past.

Part 2: The History of Bees as a Militarized Assemblage

This mandated exploration into our historical entanglements with bees exposes the ways in which bees have physically and metaphorically altered the political, social and industrial realms of the human world. Not too different from Haraway's pigeons, bees have "co-domesticated with their people," bringing their human companion species into knots of race,

gender, class, identity, and colonialism (Haraway 15). Furthermore, similar to the ways in which pigeons accompanied European colonial conquests and altered native species and ecosystems, bees were also "creatures of empire." From beeswax, honey, hives, swarms, and the individual bee itself, bees have been used as weapons in the military for thousands of years. As far back as the first century of the Roman Empire, Pompeii the Great used honey against Heptakometes in Asia Minor to lure in and then stupify them (Root 17-21). Additionally, throughout the later parts of the Roman Empire hives were launched onto invading armies and territories. More recently, beeswax was used in World War I to coat ammunition, advancing the power and effect of weaponry (Kosek 654). Ironically enough, the depiction of the bee as a "wild," uncontrolled, or natural animal, erases these critters of this militaristic, political history, that has helped shape societies all over the globe (Kosek 654).

Additionally, the bee has also been metaphorically used to mold and make sense of human sociality. By simply looking at common English phrases such as "busy bee" or "queen bee," we can see how "gender" roles, social hierarchies, and working habits of the bee colony have been reflected onto humans. Sometimes, this metaphorical exploitation of bees can be just as detrimental as their militaristic uses. For instance, Ernest Bergdolt, a member of the Nazi party, tried to use bee behavior and hive structure to backup Nazi ideology. To him, the logic of the hive exemplified the "systematic, utopian promise of Nazism" (Raffles 191). While this conception of beehive culture is not shared by everyone, Bergdolt saw bee practices such as their "disciplined subjection to the wellbeing of the greater good" or the "self sacrificial altruism of the nonreporting workers" as signs of Naziism's belief in the dissolution of the individual for the collective good, and the of discarding of people not worthy of existence (Raffles 191). While

Bergdolt purposefully chose to ignore hive matriarchal dynamics, which are very much at odds with Nazi ideology, he picked and chose elements of bee sociality to make claims about human collective behavior, and to make human individuals vulnerable to harm. Ironically enough, through our process of "becoming-with" the bee, and by using the bee to understand our world, our conception of the bee itself changes. Through this reliance on them, bees have become entangled with our own social, gendered, and racialized worlds just as much as we have become entangled with theirs.

Part 3: The Rise of the Modern "Human-Bee"

Beyond metaphoric and physical modes of militarization, bees have also expanded the capacity of human senses and what humans can accomplish, and we have expanded theirs. By being used to technologies of intelligence, we can see Tsing's idea of "staying alive" through livable collaborations playing out in a quite literal sense. Starting in the 1950s and ending the 1970s, the honeybee was used by scientists to document radioactive rates in area G in Los Alamos, New Mexico (Masco 320). Because a bee covers a vast area of land during the day to forage for pollen from plants, and then returns to their hive at night to produce honey, bees are powerful tools through which to test levels or radioactive substances. By becoming an agent of natural security, bees are transforming from a life giving entity that is productive through its ability to pollinate, to a life giving entity that is productive through its toxicity (Masco 320-321). This change indicates a transition in ecological regimes, and labels bees with a generative toxicity. In many ways, the bee is becoming a "toxic being" through our contaminating encounters with them for our own survival. Through this entanglement of lifeways and nonliving

things, humans are relying on collaborations with bees in order to transform our land and community's health. Due to Haraway's concept of "becoming-with" and the interconnected nature of an assembly, all members involved in the bee assemblage are transforming towards a mutant ecology (Masco 321).

Through the use of bees as "biomonitors," both the modern honey bee and modern human are getting created. Due to bee's heightened senses that can detect chemicals and materials that human bodies do not have the means of catching, we are able to understand the world through the eyes of the bee. In the case of Los Alamos, bees were of particular help because they are especially sensitive to a specific type of radioactive substance called tritium (Masco 320). Additionally, scientists have learned that by placing low amounts of explosive chemicals near food sources, bees will learn to associate the scent of a mine with food, and can become great tools for landmine detection (Kosek 357-358). By doing so, we are reprogramming the bee to instinctively respond to different stimuli and altering their foraging patterns. In that sense, our political, racial, social, and colonial motivations for utilizing the bee in the first place ate quite literally becoming woven into the biology of the bee. Throughout our reliance on bees as vehicles of intelligence, we are expanding the capacity of what humans can feel, detect, and see, and essentially becoming more "bee." Their chemoreceptors are getting folded into the human conscience, and we are gaining a bee's ability to identify food sources, kin, and chemicals in concentrations as low as 50-70 parts per million (Kosek 659). In doing so, however, we need to be cognisant of the types of response-abilities (Haraway 22) that these collaborative encounters require. Not only does this mean enacting a mutual trust towards the bees and the

agency that we are stripping them of, but of the ways in which humans' heightened sense might strip other humans of their agency as well.

Beyond altering the bee through trained behavioral changes, we are quite literally molding the bee through genetic modification. Unlike the previous example, this biological intervention is justified by a desire to protect multiple different lifeways, not just humans, within the assembly. In fact, part of the reason why the "Frankenbee," the genetically modified bee, is so contested right now is due to this blurring between the boundaries of which life forms are the ones "staying alive." The debate was first started in 2003, when Martin Beye, a German evolutionary geneticist, and an international team of biologists successfully decoded the bee genome. This allowed them to understand the bee chromosome, and in 2014 they were able to come out with a "designer bee" using their own gene editing advancements (Warner). Through the use of Crispr technology, Beye was able to publish a paper outlining how to build a pesticide resistant bee. Since the huge drop in bee population in 2008, caused in part by Germany's over use of neonotides, hives and colonies have never recovered (Warner). While it has lots of opposition, the ability to build a "superbee" would not only help increase their population, but also secure the future of crop production worldwide (Warner). Without genetic intervention, people worry that the crops produced for food and biofuels will suffer from a lack of pollination. Is the creation of the franken bee an example of the types of livable collaboration required for the bee species, or even the human species, to "stay with the trouble?" (Haraway 1). Given the limited space for autonomy within our complex system, is this man made mutation and contamination a necessary byproduct of our changing, multi-species collaborations? While this

genetic alteration would mean that our children's bees will be different from the bees we grew up with, this might be a needed break from the past in order to reinvent our future.

Part 4: The Dangerous Effects of Encounter

However, the response to the "bee crisis" through the creation of a Frankenbee is failing to recognize how we could potentially make the modern bee, and many other involved in the assemblage, even more vulnerable. Not too dissimilar from the ways in which agricultural companies have monopolized the market by selling farmers both their pesticides and their crop seeds that are genetically engineered to withstand those pesticides, bioengineering bees would end up privatizing beekeeping (Warner). As of now, pollination is one of the only areas that big agriculture doesn't control, and bioengineering could introduce patents and privatize one of the only bastions of agriculture that is currently open to everyone. By robbing bees of their ability to evolve and reproduce on their own, we are also robbing humans of their agency in beekeeping. Additionally, other actors entangled within this assembly could also become affected. For instance, scientists are worried that the lab-designed bee would inflict different types of symptoms upon stinging, and our current allergy medications would no longer be effective. Ultimately, because the contaminated diversity caused by bio-engineering is relational and made through encounter-based collaborations, it is non scalable. While this is not meant through the literal sense, as Frankenbees can reproduce normally on their own, these incommensurable, newly contaminated parts, will form new links when scaled up, and we have no way of predicting the effects of those links (Tsing 38).

Through gene alteration within this complex assembly, the modern bee has the potential to once again get turned into a bio-weapon. In 2016, DARPA, the United States' Department of Defense's military research department, launched a 4 year long program to investigate the use of insects, primarily aphids and whiteflies, to genetically modify crops (Kupferschmidt). Essentially, this 45 million dollar project is designed to have insects carry immune-boosting mutations to plants that would help protect them against environmental disasters such as drought, flooding, viruses and even human use of other bio-weapons (Kupferschmidt). Using insects as genetic modifiers, instead of directly modifying the target crops themselves, DARPA is able to carry out a much quicker, more flexible type of genetic modification, called "horizontal transfer" (Reeves et al). Unfortunately, this type of genetic alteration comes with a whole entanglement of societal and biological implications. As many researchers have pointed out, this type of biological technique could be used maliciously, by sending the insects to other communities and wiping out their crops, harvests, and livelihoods. In response to this worry, DARPA came out with "conditional lethal safeguards" for insect release, which state that in order to limit the effects of horizontal gene alterations, insects cannot last for more than two weeks (Reeves et al). However, the unraveling effects that would be felt if the program failed to take those safeguards, and an increasing amount of crops were affected, would be detrimental, and are not even fully known. While this technology hasn't been used specifically with bees yet, their intimate relationship with plants through pollination gives them the potential to be particularly valuable insects for gene transfer. Once again, bees would be acting as agents of "natural security," but this time not as toxic beings, but as carriers of that toxicity. Ironically enough, by using bees as bioweapons, and agents to kill, we are killing the bee as we know it.

Conclusion

Throughout the multiple emergences of the "modern bee," the boundaries between normal, abnormal, and toxic, are getting blurred and redefined. The bee is both a life giving form and a murderous being. A toxic body and a natural, bucolic critter. A carrier, a receiver, and giver of contamination. A passive thing used for human greed, and a form of agency. Through biological engineering, industrial agriculture, and climate change, wildlife zones are proposing a new type of nature. In many ways, it can be tempting to think of these multi-generational fusions of nature, culture, and society as nothing new. Assemblages are constantly changing and producing new ways of being. In that sense, social formations have been happening for years, and any type of nature can be normalized. Similar to Masco's claim that "nature" as a concept has changed in the nuclear age and transformed the entire globe into a post-nuclear formation, the bee might simply be a sign of our present, general condition (Masco 293).

Or, in Tsing's logic, by looking at the bee assemblage as a product of unintentional design, we can decenter the human and tell a much less common narrative (Tsing 152). Perhaps, we need to realize that the bee emerged not only because of capitalism and our ruined industrial landscapes, but despite them. In that sense, ruins are spaces of emergent vitalities, where through transformative encounters of overlapping "world making activities" humans are no more responsible for the design of the modern honeybee than any other life forms are. (Tsing 152). By naturalizing the world of nature, we aren't leaving humans much room for their own agency, creative decision making, and dominance over the bee.

Through this process of naturalization, however, we are starting to equalize the effects of our encounters with bees. The bee as an assembly model has the potential to be problematic, as it

is relieving humans of their responsibility in creating these dangerous and harmful multigenerational entanglements. While our changing relationship with bees has made them agents of destruction alongside humans, each player's agency in creating that destruction can't be regularized. It is important to recognize that within the assemblage, these contaminating outcomes aren't happening to the same degree in all directions. Assemblages aren't translational. We cannot try and equate or commensurate the parts (Tsing 22). Bees, humans, pollen particles, flowers, laboratories, scientists, pesticides, and a car's exhaust all work together to produce something, but they all aren't equal players in the system. Contamination through collaboration is happening to some level in all directions, but the extent to which humans are causing that change is disproportionate.

Maybe, rather than trying to make sense of the bee as an assemblage, we should think of it as "dis-assemblage:" the result of what happens when links start falling apart, disappearing, and dominant lifeways start taking over. This concept can be better understood by turning to a comic entitled "bee orchid" that Haraway includes in her book (Haraway 70). In this strange and humorous piece, we learn about a type of orchid which attracts male bees by looking like a female bee. That specific species of bee has become extinct, and the only way we know of it and what it looked like is through the flower's attempt to mimic it. The orchid is simply the plant's interpretation of what the female bee looked like to the male bee (Haraway 69). The flower becomes a speaker of the dead, and an echo of an entanglement that no longer exists. At one point, the orchid and the bee were mutually tangled up in a series of intimate encounters in which each being needed and desired the other. What happens when one of those critical beings ceases to exist? (Haraway 69). How can the life forms within the assemblage continue to grow? In the

case of the bee-orchid, without that specific type of bee to pollinate it, the flower is slowly starting to die off. And when it does disappear from our Earth, there will be no species left to speak for either organism. Through this diss-assembly, we can begin to see how strings, ties, and support systems between species start to unravel once a member of the web of connections breaks away.

How can transformative collaborations, for all involved with the assemblage, continue to happen if the bee as we know it continues to decrease in population? If they end up dropping out from the assembly as a whole, all other species that they are entangled with and contaminated by will feel the effects. This process of "making-with" will cease to happen, and new threads will be picked up and patterns formed. The figures that are enmeshed in transformations across difference will have to slowly change and rebuild their webs to create a new type of flourishing. Perhaps, the only way to prevent this diss-assembly from happening is by supporting the ever changing modern bumble bee in all its new forms. We need to reassess our notions of "contamination," and figure out what level of "toxicity" and "mutation" within the modern bee will keep these networks in place and allow them to continue changing and growing into the future.

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